TANS, DEQ Website, and Modern Real-time Monitoring

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Overview

- TANS
- DEQ Website
- 5 Myths in Water System Security
- Modern Real-time Monitoring
  - Old school v. New school
  - Modern Monitoring Techs
  - 2 Integrative Solutions: Hach's Event Monitor, YSI's EcoNet
  - RIP Dascore
  - JMAR's BioSentry
- Conclusion

TANS, Threat Advisory Notification System

Rapid, Articulate and Meaningful Information Distribution

- ~550 W/WW Officials
- ~50 Local Health Officials
- 15 Notices since Inception in December 2003
- Do you want to join? Email

  deq-threatad@mi.gov

www.virginiaestatelaw.com

Five Most Recent Notices

	TANS Notice	Date Sent
11th	DHS Interim National Infrastructure Protection Plan	Feb. 14th 2005
12th	Official EPA Emergency Response Tabletop Exercises	Mar. 16th 2005
13th	American College of Preventative Medicine: Recognizing Waterborne Disease	Mar. 28th 2005
14th	Distribution System Security Primer for Water Utilities	May 23rd 2005
15th	Security Information Collaboratives	May 23rd 2005

DEQ Website

- TANS Index
- HSPD Index
- Links to Websites
- Real-time Monitoring Info
- Government Policy Docs
- Emergency Action Card
- 8 Req's of the Bioterrorism Act

http://michigan.gov/deq/0,1607,7-135-3313_23413---,00.html

Links

- AWWA
- DHS
- EPA

Cheat Card

- Emergency Action Card
- Cut out, Fill out, Laminate
- Quick reference for facility personnel
- Cheating is OK if you're the good guys

EMERGENCY ACTION CARD

Carry this card in a wallet or ID chain

Name:

If you encounter a security breach or terrorist event:

Immediately Call:

1 Immediate Supervisor:
2 Plant Manager:
3 Local Law Enforcement:
4 DEQ District Engineer:

If you suspect contamination:

Also Call:

1 51st WMD-CST:
2 Neighboring Water System:
3 Nearest Local Hospital:

INCIDENT RESPONSE PROCESS

1 Recognize An Incident
Broken Lock, Unknown Powder, Alarm, Unknown Contamination.

2 How Severe is it?
How many systems are affected? Consider worst case scenarios.

3 Call For Help
PHONE NUMBERS ON REVERSE SIDE.

4 How could Water Quality be Impacted?
What systems are compromised? Pipe, tank, pump, valves, chemical storage?

5 Prevent the Contamination from Spreading
DO NOT RUSH TO FLUSH. Isolate and Contain the Contamination.
Location may become a CRIME SCENE. Minimize damage to evidence.

Instructions

1. Print card on heavyweight paper or poster board
2. Correctly fill in the emergency contact phone numbers
3. Cut the individual sides from the paper
4. Laminate both sides together (laminate can be found at Meijers/Walmart)

5 Water System Myths

1. MYTH: Dilution is the best solution
   - In cases of water system contamination, containment is the best solution!
   - Biological agents don't need high concentrations to reach potency
2. MYTH: Treated water is stable
   - Once the water has left the water facility, loss of control in:
     - Temperature
     - Turbidity
     - Dissolved minerals
     - Radiation, Superbowl 2003, San Diego, spikes of 20x above baseline
3. MYTH: Water systems have unidirectional flow
   - Flow is a function of many variables:
     - Demand from terminal ends
     - Pipe diameters
     - Elevation
     - Water system layout

5 Water System Myths

4. MYTH: As long as I don't drink contaminated water, I'll be fine
   - Biological/Chemical agents can aerosolize on contact with air
   - Continued terminal use = continued water system flow = greater difficulty containing contamination
   - General Public need to be aware of "Do Not Use" advisory
5. MYTH: Don't worry, we can always kill the pumps and close the valves
   - Water pipe implosions
     - In some old infrastructures, the water pressure keeps the pipe from collapsing
   - Water integrity upon resumption
     - Reversed/unpredictable flow on loss of pressure
     - Substances seeping back into non-pressurized pipes
   - Serious implications for:
     - Fire departments
     - Hospitals

Modern Real-time Monitoring

- Old school vs. New school: Grab sampling and Automated sampling
- Modern monitoring techs
  - Radiation
  - Chemical
  - Biological
- 2 Integrative Solutions
  - Hach's Event Monitor
  - YSI's EcoNet
- RIP Dascore
- JMAR's BioSentry

Old school v. New School

- Continuous Online
  - Pros
    - Unattended
    - Immediate Notification
  - Cons
    - Fixed Location
    - Cost Prohibitive
    - Accuracy and Reliability
    - Infrastructure Requirements
- Grab Sample
  - Pros
    - Mobile
    - Cheap
  - Cons
    - Not effective for rapid identification of problems
    - Human Labor
    - Sample may change on the way to the lab

http://www.waynecounty.com/coalitiontochangetheculture/imgs/conf lict.jpg

http://www.epa.gov/safewater/watersecurity/guide/chemicalbiologicalandradiologicalsensoroverview.html

http://www.edie.net/news/news_story.asp?id=10224&channel=0

Radiation Monitoring

- Limited Number of RTM Products
  - Technical Associates
    - SSS-33-5FT
    - MEDA-5T
  - Canberra
    - OLM-100, ILM-100
  - DoD, Los Alamos, prototype
  - $20,000-$75,000
- Grab-Sample still recommended as method of choice

http://www.tech-associates.com/dept/sales/product-info/sss-33-5ft.html

Chemical Monitoring

1. Chlorine Concentration
   - Many organisms/toxins combine with chlorine
   - Chlorine as a surrogate for detection (req'd SDWA)
   - Not everything reacts with chlorine:
     - Anthrax, T-2 Mycotoxin, Microcystins, Ricin Cryptosporidiosis
   - Three featured RTM products:
     - HACH CL-17
     - GLI/HACH AccuChlor2
       - Food-grade vinegar as a buffer
     - Teledyne Isco Orbit Chlorine Analyzer
   - Cost range: $2,700-$10,000

Maintenance Requirements

- Regular replenishment of consumables (reagents, buffers)
- Periodic maintenance and calibration

http://www.epa.gov/safewater/watersecurity/guide/chlorinemeasurementsensor.html

Chemical Monitoring

2. Arsenic Concentration
   - Required to monitor by the SDWA
   - No off-the-shelf RTM solutions exist, laptop-enabled portable sensors are available
     - TraceDetect Nano-Band Explorer
     - Monitoring Technologies International's PDV-6000
   - Products inaccurate, still useful for water security, (i.e. deviation from norm is cause for alarm)
3. TOC Analyzers (total organic carbon)
   - High or Low temperature analyzers (high being more sensitive)
   - Surrogate for contaminants, deviation from average is cause for alarm, high sensitivity devices not required
   - Many RTM devices on market
     - Hach 1950plus
     - GMI-Shimadzu TOC 5000
   - $18,000-$28,000

Maintenance Requirements

- Weekly maintenance and calibration (recommended)

http://www.epa.gov/safewater/watersecurity/guide/chlorinemeasurementsensor.html

Biological Monitoring

1. BOD analyzer (biochemical oxygen demand)
   - Surrogate method measures respiration of biomass, interpreting less respiration as presence of toxin
   - Used in Europe for decades
     - Envitech's STIPTOX-adapt
     - $20,000 to $30,000
   - System attempts to preserve biomass
2. Luminescent Toximeters
   - Surrogate method measures luminescence of *Vibrio fischeri*, interpreting less luminescence as presence of toxin
   - No current RTM products exist
   - Two laboratory products
     - Microtox - $18,000
     - DeltaTox - $5,900, similar but without temp controls

Maintenance Requirements

- Biomass replacement (if needed)
- Nutrient solution replacement (consumed at 0.6L/day)
- Periodic oxygen sensor, pump calibration

Maintenance Requirements

- Media replacement
- Reagent replacement
- Periodic cleaning

http://www.epa.gov/safewater/watersecurity/guide/chlorinemeasurementsensor.html

Hach's Event Monitoring System

- Event Monitoring System
  - SCADA compliant communications
  - "Learns" about baseline parameters
  - After fingerprinting an event (e.g. what the parameters look like when a pump fails), the system can enumerate the event on its reoccurrence ("Hey guys, uh, pump #7 failed again")

Multiple Locations
In Distribution System

PipeSonde In-Pipe Probe - $8k

- < pH
- < Conductivity
- < Turbidity
- < Temperature
- < ORP
- < Chlorine/DO
- < Line Pressure

Event Monitor Trigger System

One or more locations
Inside water plant

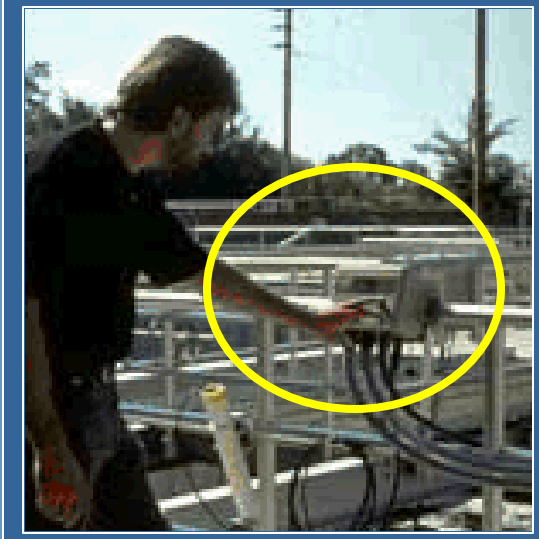
Water Distribution Monitoring Panel - $12.5k

- < pH
- < Conductivity
- < Turbidity
- < Chlorine

All images from http://www.hach.com

YSI's Sensor Logging Models

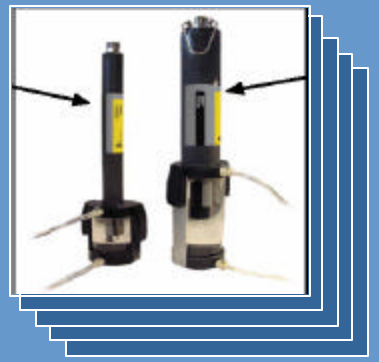
YSI 6500 for SCADA



Stand-Alone Logging

Sensor Collector/Aggregator

Sensors



Laptop

EcoNet

Web-enabled command & control

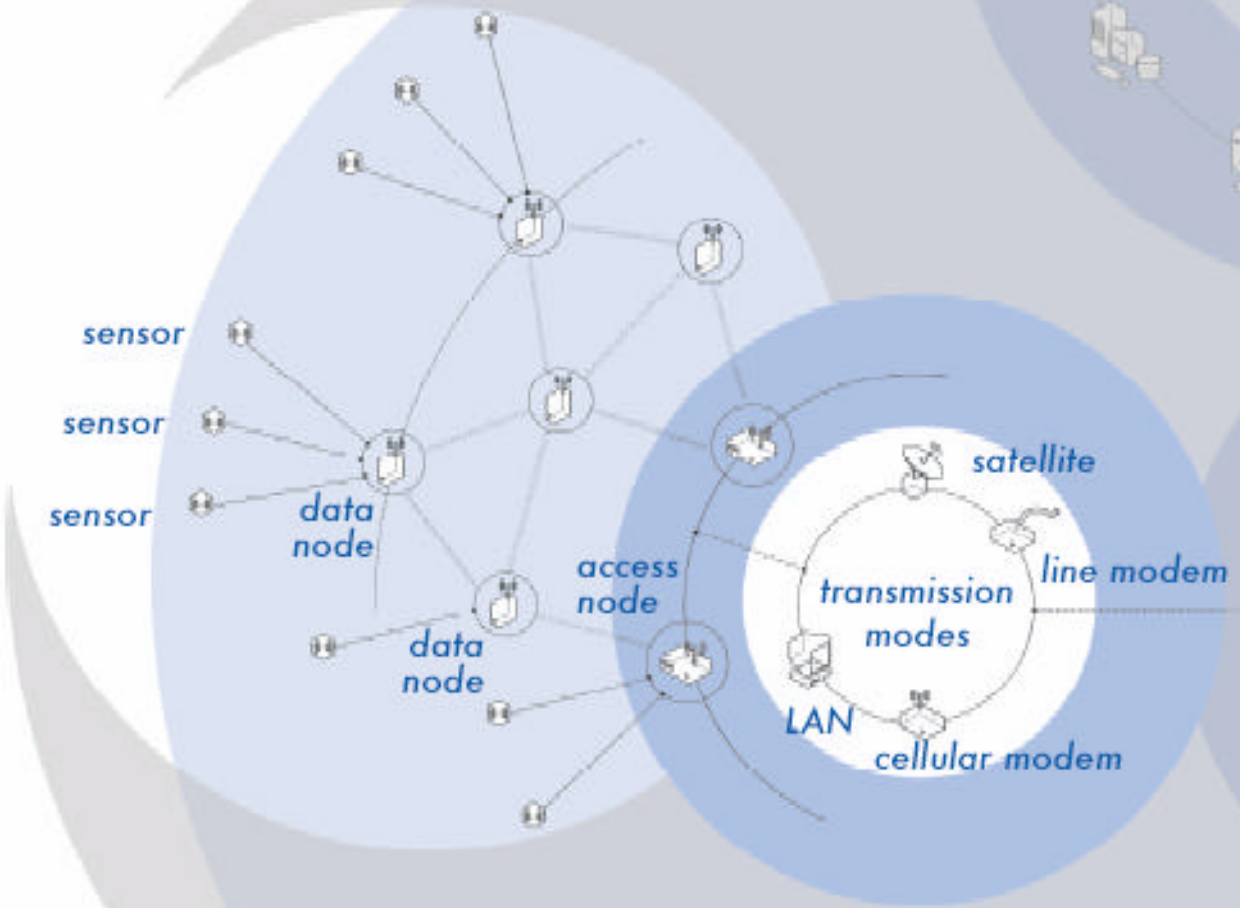
Access Node

Access Node
RF => Cell, WiFi, Sat, 56k, LAN

All images from this and the next page http://www.ysi.com

YSI's EcoNet

The YSI EcoNet™ Mesh Network

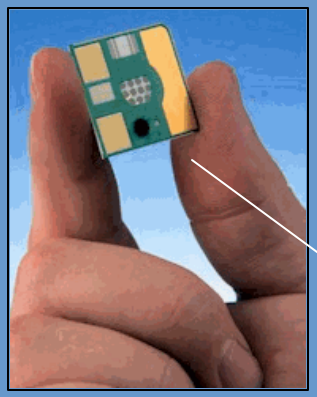


Data Nodes collect data from the sensors (YSI, SonTek, or other SDI-12, analog, or digital sensors) at user-defined intervals, pack the data, and forward it to the Access Nodes via a spread spectrum RF mesh network.

Access Nodes collect data from both directly connected sensors and one or several Data Nodes, package the data, and send it to the Data Center via line modem, cellular modem, satellite, or Local Area Network (LAN).

Dascore - *Vaporware*

- Six CENSE
- Measures
  1. ORP
  2. Conductivity
  3. Temperature
  4. Chlorine
  5. DO
  6. pH
- 37mm stainless steel probe through 1.5” to 2” corporation stop
- SCADA-Compatible



Maintenance Requirements

- Ceramic chip has 6 month average service life

JMAR – BioSentry Prototype

- BioSentry
  - Trials underway Olivenhain Municipal Water District (San Diego)
  - Only detects microorganisms
- Using lasers, BioSentry detects fingerprint characteristics of microorganisms in the input water, then compares the collected data to a library of known fingerprints
- Detection Time (currently 1L/hr)
  - 1 minute – 5,000 organisms/liter
  - 10 minutes – 500 organisms/liter
  - 100 minutes – 50 organisms/liter

Maintenance Characteristics

- Does not use consumables during normal operation

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